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Atmospheric Measurement Techniques Discussions

Interactive comment on "Airborne sunphotometer PLASMA: concept, measurements, comparison of aerosol extinction vertical profile with lidar" *by* Y. Karol et al.

Anonymous Referee #2

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Review for Atmospheric Measurement Techniques

Title: Airborne sunphotometer PLASMA: concept, measurements, comparison of aerosol extinction vertical profile with lidar

Authors: Y. Karol, D. Tanre, P. Goloub, C. Vervaerde, J. Y. Balois, L. Blarel, T. Podvin, A. Mortier, and A. Chaikovsky

General Comments:

This is a useful paper on a new airborne sunphotometer, which may provide signifi-

cant capability in application to satellite validation, vertical profile characterization and validation, and also in application to measuring ground based horizontal gradients. In general I find the paper to be fairly well written, however the English grammar and vocabulary choices require numerous corrections and I suggest an English editor to help (see some specifics below). I recommend that the authors consider adding some further details on the PLASMA instrument specifics. For example, the 1.5 degree field of view (I assume that is the full FOV?) is narrower than other airborne sunphotometer FOV's. Therefore this is a significant advantage for PLASMA as the correction for forward scattered diffuse into the FOV (biasing AOD too low) is less than other airborne sunphotometers. This is an advantage that should be explained and detailed. Another instrument issue that needs more clarification is the temperature sensitivity of PLASMA. On page 6816 (lines 13-15) it is stated that PLASMA is 'not temperature sensitive' from 0-45 degrees C but is this because the instrument is temperature controlled or are the detectors temperature insensitive in this range? Please give some more details on the silicon detectors, including some specifics on spectrally dependent temperature sensitivity.

I provide some specific comments (mostly minor) below that I suggest the authors should consider in revising this paper.

I recommend that this paper be published after revisions and suggest that it could make a useful contribution to the literature.

Specific Comments:

p. 6814, lines 4-5: Some poor vocabulary choices: I suggest changing the first words of these 2 sentences: 'Doing' to 'Taking" and also change 'Thanks' to 'Due'.

p. 6814, line 12-14: Please add the reference Hansen et al. (1997) for the semi-direct effect, and explain that this atmospheric heating and surface cooling creates a more stable temperature profile that results in less cumulus cloud cover (Koren et al. 2004).

p. 6815, line 13-14: The sentence that begins 'If recent similar airborne. . .' is not a complete sentence, something is missing as it does not currently make sense.

p. 6815, line 15: Please define or explain the AATS and FUBIS-ASA acronyms, what do they stand for?

p. 6815, line 16: 'settle' is a poor word choice here, I suggest saying "to be easily installed" instead of "to easily settle it"

p. 6815, line 19: Please change 'car 'to 'automobile' here and throughout the manuscript, including the heading of section 6.

p. 6816, line 5-7: Sentence that begins with "If GPS can be usually disconnected in flight.." I think I understand what you are trying to say here but the English and grammar are very awkward, making it difficult to understand. This needs to be re-written.

p. 6817, line 7: Why do you say in the case of 'spherical or randomly oriented particles'? Sunphotometer measured AOD is not sensitive to particle shape, so why do you suggest it is?

p. 6817, line 15-16: Note that such a crude pressure correction can be a significant source of error in the UV wavelengths where the Rayleigh OD is high, so this should be mentioned.

p. 6818, line 11: "Evolution of the instrument. . ." This is very odd wording, not sure what you are trying to say here. Maybe you mean 'Calibration and comparison to ground-based measurements" as the heading for this section?

p. 6819, line 9-11: I assume you mean a profile takes 30 minutes, not the entire flight. It is not necessarily true that in 30 minutes the airmass change is slight if you are referring to optical airmass (1/cos(SZA)), since if the flight occurs early in the morning or in the evening it can change rapidly. Or are you referring to the temporal variation of aerosol profile characteristics? This sentence obviously has me confused, and needs to be re-written to make it clear.

p. 6820, line 4-5: In referring to the accuracy of AERONET measured AOD please include the fact that AERONET Cimel accuracy for REFERENCE instruments is 0.002 to 0.009 (Eck et al., 1999).

p. 6820, line 13-16: When you say 'gaseous correction specifics' can you give more detail here on the ozone and NO2 data and absorption spectra that you use? The 343 nm AOD diurnal pattern in Figure 3 looks to me that it may be caused by out-of-band leakage for the filter since the PLASMA AOD are too low at large optical airmass (large SZA). Please consider this possibility and address this issue in the text.

p. 6821, line 26: change 'thanks' to 'due'

p. 6822, line 19: Please also include the date of the measurements in the Figure 7 caption.

p. 6822, line 23-24: Please state that Level 2 AERONET data were used.

p. 6823, line 1-2: Angstrom exponent variation from $\sim$1.55 to 1.8 is not insignificant however, suggesting some changes in aerosol size, perhaps due to humidification or cloud interaction. Also, please write something about the single AERONET value of Angstrom = 1.92 at $\sim$15 UTC. Was this Level 2 data and was it near to clouds (if clouds were near then there would be data gaps in time)?

p. 6823, line 5: Add the words 'accuracy of' before 0.005.

p. 6823, line 6: 'onboard' should be 'airborne'

p. 6823, line 7: 'either' should be 'or'

p. 6823, line 14: 'going' should be 'planning'

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 6813, 2012.